

1. (Currently Amended) A laser [for generating ultra short optical pulses], comprising:  
a cavity which repeatedly passes light energy along a cavity axis;  
a length of multi-mode optical fiber having a cladding and doped with a gain medium and positioned along said cavity axis;  
a pump coupled to said cladding for exciting said gain medium;  
[a mode locking mechanism positioned on said cavity axis; and]  
an optical guide positioned on said cavity axis which confines the light amplified by said multi-mode optical fiber to preferentially the fundamental mode of said multi-mode optical fiber.
2. (Currently Amended) A laser [for generating ultra short optical pulses] as defined in Claim 1 wherein said mode locking mechanism comprises a passive mode locking element.
3. (Currently Amended) A laser [for generating ultra short optical pulses] as defined in Claim 2 wherein said passive mode locking element comprises a saturable absorber.
4. (Currently Amended) A laser [for generating ultra short optical pulses] as defined in Claim 3 wherein said saturable absorber comprises InGaAsP.
5. (Currently Amended) A laser [for generating ultra short optical pulses] as defined in Claim 3 additionally comprising a power limiter for protecting said saturable absorber.
6. (Currently Amended) A laser [for generating ultra short optical pulses] as defined in Claim 5 wherein said power limiter comprises a two photon absorber.
7. (Currently Amended) A laser [for generating ultra short optical pulses] as defined in Claim 1 wherein said optical guide comprises a single-mode mode-filter fiber on said cavity axis.
8. (Currently Amended) A laser [for generating ultra short optical pulses] as defined in Claim 7 wherein said single-mode mode-filter fiber is fusion spliced onto one end of said multi-mode optical fiber.
9. (Currently Amended) A laser [for generating ultra short optical pulses] as defined in Claim 8 wherein said single-mode mode-filter fiber is tapered at said fusion splice.
10. (Currently Amended) A laser [for generating ultra short optical pulses] as defined in Claim 8 wherein both said single-mode mode-filter fiber and said multi-mode fiber are tapered at said fusion splice.

13. (Currently Amended) A laser [for generating ultra short optical pulses] as defined in Claim 1 wherein said pump is coupled to said multi-mode fiber along said cavity axis.

11. (Currently Amended) A laser [for generating ultra short optical pulses] as defined in Claim 13 additionally comprising an optical coupler for coupling said pump to said multi-mode fiber.

12. (Currently Amended) A laser [for generating ultra short optical pulses] as defined in Claim 13 additionally comprising a v-groove on said multi-mode optical fiber for coupling said pump to said multi-mode fiber.

13. (Currently Amended) A laser [for generating ultra short optical pulses] as defined in Claim 1 additionally comprising a polarization beam splitter for outputting said ultra-short optical pulses from said laser.

14. (Currently Amended) A laser [for generating ultra short optical pulses] as defined in Claim 1 wherein said cavity comprises a pair of reflectors at its opposite ends.

15. (Currently Amended) A laser [for generating ultra short optical pulses] as defined in Claim 17 wherein one of said pair of reflectors is partially reflecting and provides the output for said cavity.

16. (Currently Amended) A laser [for generating ultra short optical pulses] as defined in Claim 17 wherein said mode locking mechanism comprises a saturable absorber, and wherein one of said reflectors is formed on a surface of said saturable absorber.

17. (Currently Amended) A laser [for generating ultra short optical pulses] as defined in Claim 19 wherein said mode locking mechanism additionally comprises a power limiter for protecting said saturable absorber, and wherein said saturable absorber is formed on a surface of said power limiter opposite said one of said reflectors.

18. (Currently Amended) A laser [for generating ultra short optical pulses] as defined in Claim 20 wherein said power limiter comprises a two-photon absorber.

19. (Currently Amended) A laser [for generating ultra short optical pulses] as defined in Claim 1 additionally comprising a linear phase drift compensator on said cavity axis.

20. (Currently Amended) A laser [for generating ultra short optical pulses] as defined in Claim 22 wherein said linear phase drift compensator comprises a Faraday rotator.

21. (Currently Amended) A laser [for generating ultra short optical pulses] as defined in Claim 23 wherein said linear phase drift compensator comprises a pair of Faraday rotators.

22. (Currently Amended) A laser [for generating ultra short optical pulses] as defined in Claim 22 additionally comprising a linear polarization transformer on said cavity axis.

23. (Currently Amended) A laser [for generating ultra short optical pulses] as defined in Claim 25 wherein said linear polarization transformer comprises a wave plate.

24. (Currently Amended) A laser [for generating ultra short optical pulses] as defined in Claim 1 wherein said ultra-short optical pulses preferentially in the fundamental mode of said multi-mode optical fiber have a pulse width below 500 psec.

25. (Currently Amended) A laser [for generating ultra short optical pulses] as defined in Claim 1 additionally comprising an environmental stabilizer on said cavity axis to assure that said cavity remains environmentally stable.

26. (Currently Amended) A laser [for generating ultra short optical pulses] as defined in Claim 31 wherein said environmental stabilizer comprises a Faraday rotator.

27. (Currently Amended) A laser [for generating ultra short optical pulses] as defined in Claim 32 wherein said environmental stabilizer comprises a pair of Faraday rotators.

28. (Currently Amended) A laser [for generating ultra short optical pulses] as defined in Claim 1 wherein said optical guide comprises an optical fiber doped with an amplifying medium to provide gain guiding.

29. (Currently Amended) A laser [for generating ultra short optical pulses] as defined in Claim 34 wherein said amplifying medium is concentrated centrally within a fraction of the core diameter of said optical fiber.

30. (Currently Amended) A laser [for generating ultra short optical pulses] as defined in Claim 1 wherein said optical guide comprises a single-mode optical fiber on said cavity axis.

31. (Currently Amended) A laser [for generating ultra short optical pulses] as defined in Claim 1 wherein said optical guide comprises a mode-filter on said cavity axis.

32. (Currently Amended) A laser [for generating ultra short optical pulses] as defined in Claim 37 wherein said mode filter excites the fundamental mode of said multi-mode fiber.

33. (Currently Amended) A laser [for generating ultra short optical pulses] as defined in Claim 38 wherein said mode filter excites the fundamental mode of said multi-mode fiber with an efficiency of at least 90%.

34. (Currently Amended) A laser [for generating ultra short optical pulses] as defined in Claim 1 wherein said cavity additionally comprises a positive dispersion element.

35. (Currently Amended) A laser [for generating ultra short optical pulses] as defined in Claim 40 wherein said positive dispersion element comprises a length of single-mode positive dispersion fiber positioned along said cavity axis.

36. (Currently Amended) A laser [for generating ultra short optical pulses] as defined in Claim 41 additionally comprising an output coupler for limiting the light energy at said single-mode positive dispersion fiber to less than 10% of the peak power in said cavity.

37. (Currently Amended) A laser [for generating ultra short optical pulses] as defined in Claim 42 additionally comprising a frequency converter for compressing pulses generated by said cavity.

38. (Currently Amended) A laser [for generating ultra short optical pulses] as defined in Claim 43 wherein said frequency converter comprises a frequency doubler.

39. (Currently Amended) A laser [for generating ultra short optical pulses] as defined in Claim 44 wherein said frequency doubler comprises chirped periodically poled LiNbO<sub>3</sub>.

40. (Currently Amended) A laser [for generating ultra short optical pulses] as defined in Claim 1 wherein said multi-mode fiber includes a core, and wherein said gain medium in said multi-mode optical fiber is concentrated centrally within the core of said multi-mode fiber.

41. (Currently Amended) A laser [for generating ultra short optical pulses] as defined in Claim 1 wherein said cavity additionally comprises a fiber grating written onto said multi-mode fiber, said grating primarily reflecting the fundamental mode of said multi-mode fiber.

51. (Canceled)

52. (Canceled)

53. (Canceled)

54. (Canceled)

55. (Currently Amended) A method of generating ultra-short optical pulses, comprising: circulating light energy within a laser cavity;

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amplifying said light energy within said laser cavity in a bent multi-mode fiber; and  
confining said light energy within said laser cavity substantially to the fundamental mode of  
said multi-mode fiber.

56. (Original) A method of generating ultra-short optical pulses as defined in Claim 55  
additionally comprising mode locking said light energy.

57. (Original) A method of generating ultra-short optical pulses as defined in Claim 55  
wherein said confining comprises mode filtering said light energy.

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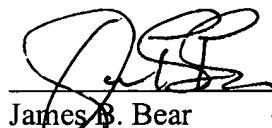
Respectfully submitted,

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